

HOHENPEISSENBERG OZONESONDE INTERCOMPARISON

A. C. Holland and A. L. Torres, *Wallops Flight Center, Wallops Island, Virginia*

ABSTRACT

A series of dual-instrument vertical ozone soundings was carried out for the purpose of comparing the Electrochemical Concentration Cell Ozonesonde with different ozonesondes used by the international scientific community. Total ozone overburdens at the time of the soundings were also measured with a Dobson spectrophotometer.

INTRODUCTION

Soundings of the vertical ozone profile by balloon-borne instruments not only provide information on the detailed structure of the profile, but also complement and help validate data from remote-sensing methods. Since ozonesondes used by various international groups frequently differ, it is important that the instruments be brought together to determine their relative performance in measuring ozone. For this reason representatives of the USA, FRG, DDR, and Japan gathered in Hohenpeissenberg, FRG, during April of 1978 for such an intercomparison, organized by the WMO.

Ten dual-instrument soundings were carried out with the Electrochemical Concentration Cell (ECC) Ozonesonde. The ECC sonde was paired with a different ozonesonde during nine flights, while the tenth was made with two ECC sondes. At the time of this writing the WMO has not yet released the composite data set to the individual participants. Data is available concerning the agreement between ECC and Dobson measurements of total ozone, however, and is presented below. The result of the single sounding involving a pair of ECC ozonesondes is also given.

RESULTS

The total ozone overburdens as determined with the ECC ozonesonde are compared with the corresponding values obtained from Dobson instruments in Table 1. The mean percentage difference between the ECC and Dobson values was 5.6 ± 13.6 , where the uncertainty represents one standard deviation. Two of the ECC values were inexplicably high and raised the mean difference and variation considerably. In general, however, the results are in keeping with those of an earlier study (1) in which a large

number of ECC sondes were calibrated relative to a UV standard. The latter work demonstrated a mean slope of near unity, but with a 6% variation (one standard deviation) about the mean.

Unlike the earlier work mentioned above (Reference 1) in which correcting ECC profiles with UV calibration data reduced the systematic errors between ECC and Dobson total ozone values (for a 30 sample set), correcting the present data had no significant effect. The UV-corrected data and the variations from the corresponding Dobson values are shown in the last two columns of Table 1. Use of the calibration data changed the mean percentage difference between the ECC and Dobson values from 5.6 ± 13.6 (uncorrected) to 5.8 ± 12.0 (corrected).

The dual-instrument sounding involving two ECC sondes was unusual in that the two sondes tracked one another very well up to about 70 mb. Above this height one of the sondes began indicating ozone concentrations as much as 45% higher than the other, although the general shapes of the two profiles were the same. The sonde indicating lower ozone readings gave a much closer total ozone value to that of the Dobson (1.9% difference) than did the other (19.3% difference). Inspection of the records failed to indicate any obvious source of the discrepancy.

REFERENCES

1. Torres, A. L., and A. R. Bandy, Performance Characteristics of the Electrochemical Cell Ozonesonde, J. Geophys. Res., in press.

TABLE 1. Comparison of total ozone values from ECC data (Ω_E), UV-corrected ECC data (Ω_{EUV}), and Dobson measurements (Ω_D).

DATE	Ω_E^a	Ω_D^a	$\frac{\Omega_E - \Omega_D}{\Omega_D} \times 100$	Ω_{EUV}^a	$\frac{\Omega_{EUV} - \Omega_D}{\Omega_D} \times 100$
4/5/78	370	412	-10.3	374	-9.3
4/6/78	440	443	- 0.6	447	0.9
4/7/78	400	390	2.7	425	8.9
4/10/78	368	388	- 5.0	373	-3.9
4/11/78	410	388	5.7	403	3.8
4/12/78	462	426	8.6	477	11.9
4/14/78	430	418	3.0	426	2.0
4/17/78 ^b	433	425	1.9	440	3.7
	507	425	19.3	502	18.1
4/18/78	385	398	- 3.3	378	- 5.1
4/20/78	559	401	39.5	535	33.3

^a units of m atm-cm

^b pair of ECC ozonesondes flown together